

Nonpoint Source Management Annual Report 2007



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Cover Photo: Site of the Suncook River avulsion through former gravel pit in Epsom, NH. Photo taken three days after avulsion occurred on May 16 2006.

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Introduction

As we work on watershed management in the New Hampshire landscape, it is important to keep our focus on clean water: what it means and why it's important. The cause and effect relationship between the developed landscape and water quality is well documented. When impervious surfaces exceed ten percent of a watershed's land area, water quality is likely to degrade. This could mean declining fisheries, increased flooding and bank erosion, and unsafe water for swimming.

While there are many actions by many people and organizations that improve water quality, the projects described in this report were primarily funded with Clean Water Act Section 319 funds from the U.S. Environmental Protection Agency. Beginning in 2004, we began to quantify how much loading 319 projects reduced for three pollutants: nitrogen, phosphorus, and sediment. While these numbers tell a story about each project, we need to keep our focus on the water. Is it getting cleaner?

In order to track our watershed restoration efforts, we keep a count of the number of impaired waters that are restored through watershed management. The first 319 project to document successful restoration of an impaired water was Bog Brook, completed in 2004 and removed from the impaired waters list in 2006. EPA's website includes a *Success Story* describing the project at www.epa.gov/owow/nps/Success319/state/nh_bog.htm.

During 2007, two more impaired waters were determined to be fully restored due to 319 watershed project activities: Middle Brook Canal on Lake Winnepesaukee in Moultonborough, and Crystal Lake in Manchester. Look for these success stories on the web during the coming year.

Nationally, EPA has committed to restoring 2,250 impaired waterbodies. We will continue to report annually our progress toward this national goal.

This report describes the results and outcomes achieved from projects completed during federal fiscal year 2007, which ended on September 30, 2007. During the year, we executed grant agreements for nearly \$1 million of new projects, all of which are focused on achieving quantifiable clean water goals.

Investigations

DES began implementing pollution source investigations in the coastal watershed in 1996. At that time, the top priority water quality issue in the watershed was related to bacterial sources, which were frequently causing the closure of shellfish beds. Years later DES continues to find and investigate not only the old and forgotten illicit discharges, but new sources that pop up every year either by incorrect plumbing, infrastructure failure or intentional discharging. In 2007 inves-



Results of dye testing showing a sewer storm drain cross connection in Portsmouth.

tigations helped locate eight sources linked to sewer discharge in four different towns and cities. Five of these sources were disconnected with 10 sources from 2006-07 investigations currently under investigation or scheduled for disconnect. In addition, DES staff assisted municipalities in identifying further sources through smoke and dye testing of storm drains along with conducting in-field training sessions to help local communities investigate and detect illicit discharges sources on their own. A summary of the 2007 field investigations is provided below.

Summary of Illicit Discharge Investigations and Detection 2007						
Town/City	Samples Collected	Samples E.coli >406cts/100ml	Sources Identified	Sources under Investigation or Scheduled for Disconnect	Sources Eliminated	Est. Remaining Illicit Sources
Barrington	3	1	0	0	0	0
Dover	21	12	2	3	1	3-5
Durham	0	0	1	0	1	0
Epping	18	5	0	2	0	2
Exeter	10	0	0	0	0	0
Goffstown (Merr)	4	0	0	0	1	0
Hampton	1	0	0	0	0	0
Newmarket	3	0	0	0	1	0
Madbury	2	1	0	0	0	0
Portsmouth	16	7	3	3	0	2-3
Rollinsford	6	5	0	0	0	0
Somersworth	23	3	2	2	1	1-3
Total	107	34	8	10	5	6-11

Education and Outreach

Due to sustained positive responses and numerous inquiries received, the environmental news column Greenworks continued to be released both electronically and via mail to state and local publications as well as DES staff. New and popular topics included: "Bright Nights," "Artificial or Real? Which Tree is Right for the Environment?," "Cleaner Snowmobiling in New Hampshire," "Do-it-Yourself, and be a Green Backyard Mechanic," and "Invading New Hampshire Waters." Past publications can be found at www.des.nh.gov/gw-list.htm.

Watershed Assistance Section outreach staff continued to participate in the "Salt Reduction Workgroup" to assist with gaining support and buy-in of the Total Maximum Daily Load and a salt reduction implementation plan for the watersheds impaired for chloride in the I-93 corridor expansion area. Social research was incorporated into identifying BMPs and behavior changes needed to reduce salt application to roadways and parking lots and developing an optimal strategy for targeting outreach, obtaining salt use information, designing regulatory approaches, and evaluating and documenting success.

In FFY 2007, several 319 grant recipients included planning for outreach and education efforts as a component of their restoration or local initiative projects. With a strong focus on addressing a closer look at audiences, barriers, and incentives, outreach staff provided facilitation and coordination on developing the most effective messages and efficient methods to accomplish the project goals. Project

milestones included measurable changes in knowledge, attitude, and behavior. The town of Peterborough worked through this process to design an outreach strategy for structural and non-structural BMPs and to obtain the support of several downtown businesses. The Pawtuckaway Lake Improvement Association adopted some of these steps while including lake residents in the process of designing the messages for their lake information packet.

For efficiency and consistency, coordinating with stakeholders and partners has evolved into a critical component of outreach and education for the Watershed Assistance Section. Efforts in FFY 2007 include:

- Working with the NH Estuaries Project on the “Participation, Outreach, and Education Team” and assisting with a series of workshops on the importance of buffers held for coastal watershed decision makers.
- Continuing active support with the Natural Resource Outreach Coalition on water resource and land use local regulation and education activities for the towns of Milton and Hampton.
- Supporting several New Hampshire regional stormwater coalitions formed by communities required to meet federal Phase II stormwater regulations.
- Providing stormwater, outreach planning, antidegradation, BMP, IDDE and LID related presentations at various state venues, e.g., Office of Energy and Planning and NH Estuaries Project conferences.

The Small Education and Outreach Grant Program for Nonpoint Source Pollution continued to provide financial and technical assistance for outreach projects. Three projects were completed in FFY 2007.

Small Education and Outreach Grants		
Project Description	Organization	Amount Paid
Cyanobacteria Public Awareness	Town of Pelham Parks and Recreation	\$1,200
Sustainable Behavior Change Workshop	Aceti Associates	\$2,496
Ossipee Watershed Outreach Initiative	Green Mountain Conservation Group	\$2,000

Training Provided to Municipalities for Illicit Discharge Detection and Elimination (IDDE) and Good Housekeeping Practices

Last year the Watershed Assistance Section assisted the Seacoast Stormwater Coalition, a steering committee comprised of department of public works (DPW) personnel from 18 Municipal Storm Sewer System (MS4) communities in the New Hampshire coastal watershed in producing a manual titled *Guidelines and Standard Operating Procedures: Illicit Discharge Detection and Elimination and Pollution Prevention/Good Housekeeping for Stormwater Phase II Communities in New Hampshire*. Funding was provided by pass through funds from the New Hampshire Estuaries Project (NHEP). In addition to the benefits received from the final product, the process of developing the manual provided a unique opportunity for various DPW staff to work together. For the Illicit Discharge Detection and Elimination (IDDE) section, DPW management staff participated in brainstorming sessions. For the standard operating proce-

dures (SOP) section, general laborers and other staff in the field participated in an interactive coordinated review meeting to address applicability of the SOPs. This not only provided expertise to assist with the content of the manual but also encouraged buy-in and use of the finished product.

The coalition then secured another grant from NHEP to use the manual contents to provide training for municipal and university employees. Two training modules were developed: one to focus on IDDE for DPW management and one to provide pollution prevention/good housekeeping SOPs for staff in the field.

The training was a huge success. Almost all of the two IDDE training workshops and seven SOP sessions were full to capacity with over 250 attending from about 15 towns and the University of New Hampshire. Attendees learned about the impacts of washing vehicles near storm drains; the effects of mercury on fish; and how silt and dirt can contaminate surface water. Evaluations indicated participants enjoyed the training, thought it was worth their time, and would use concepts they were taught to prevent stormwater pollution.

This education and outreach campaign is a great example of community stakeholders partnering with state agencies and non-profits. The parties involved now understand why stormwater is regulated and how they can reduce their impacts to water quality to benefit their local communities while meeting federal and state regulatory requirements.



SOP training held in Exeter.

Scoop the Poop: Implementing Science-based Decision-making and Social Marketing at the Local Level

The 2005 Annual Report highlighted a successful pilot pet waste outreach and education project in Dover. The project focused on one watershed in the Bellamy River where results from microbial source tracking studies indicated that dogs are a prevalent source of bacterial contamination. To address the issue, DES developed a comprehensive science-based outreach program to motivate residents to change behavior by picking up after their dogs and disposing of the pet waste properly.

Since the Dover pilot project, a comprehensive New Hampshire pet waste program was created. First, the Dover program's templates and instructions were documented in a guide "The Inside Scoop: How to Conduct a Pet Waste Outreach Campaign." The guide was distributed and made available on a new link to the DES website. A pet waste project training workshop and a request for proposals for a special Section 319 restoration grant was then offered to other coastal communities that had identified dogs as a source of bacterial contamination. Grants were awarded to five municipalities and organizations to incorporate community based social marketing and measurable results into their pet waste outreach programs. Grant project components included: partnering with city boards, city staff, residents, and volunteers, creating outreach programs tailored specifically for local issues, conducting surveys on existing behavior and perceptions, providing interviews and work sessions to identify barriers and incentives to changing residents' behavior, observing pre and post program behavior, and program evaluation. Through the project, the communities developed innovative ways to reach their audi-

ences including “Scoop the Poop” pledges, an art contest, a neighborhood ambassador program, and more. Copies of the guide on how to implement your own pet waste outreach program are available at www.des.nh.gov/Coastal/scoopthepoop.htm.

Agricultural Nutrient Management Grant Program

DES continued to assist the New Hampshire Department of Agriculture in implementing its nutrient management grant program. The program provides financial, educational and technical assistance to agricultural operators to prevent or mitigate water pollution resulting from livestock and agricultural land management activities. DES contributes thirty thousand dollars in 319 Base funds annually toward this program. Between July 1, 2006 and June 30 2007 the Department of Agriculture funded 25 projects totaling \$61,139. See the appendix for a complete list of funded projects.

Highlights and Overview of Completed Projects

Coastal Watershed

Cocheco River Environmental Quality Characterization, Monitoring and Restoration, Cocheco River Watershed Coalition (2001 Restoration)

Grant Amount: \$14,330 Local Match: \$12,540

The Cocheco River Watershed Coalition (CRWC) began this project in 2003 to identify existing watershed conditions, address known impairments through restoration, and identify sources of contaminants to the Cocheco River ecosystem. The final products produced were the *Cocheco River Watershed Environmental Quality Report, Watershed Restoration and Implementation Plan for the Cocheco River* and *Cocheco River Watershed Monitoring Plan*.



Cocheco River. Photo courtesy of the Cocheco River Watershed Coalition.

The Cocheco River watershed encompasses 185.2 square miles in southeastern New Hampshire and includes eight subwatershed areas. Land use in the watershed ranges from urban to rural. Known impairments include aquatic life (pH, nonnative aquatic plants, low dissolved oxygen, phosphorous, and toxic metals), primary and secondary contact recreation (bacteria), and fish consumption (mercury). The Environmental Quality Report provides a comprehensive compilation of existing data and information about the watershed, an interpretation of current watershed conditions, and a plan for future monitoring activities. The report served as a scientific foundation for the watershed restoration plan.

The Watershed Restoration and Implementation Plan highlights specific restoration goals and actions for four major categories: public perception and education; water quality restoration; wildlife and habitat; and infrastructure and water quality. The plan also provides a schedule for implementation of the restoration activities and describes how success will be measured. The CRWC is currently using

the plan to provide guidance for implementation of the infrastructure and water quality restoration activities.

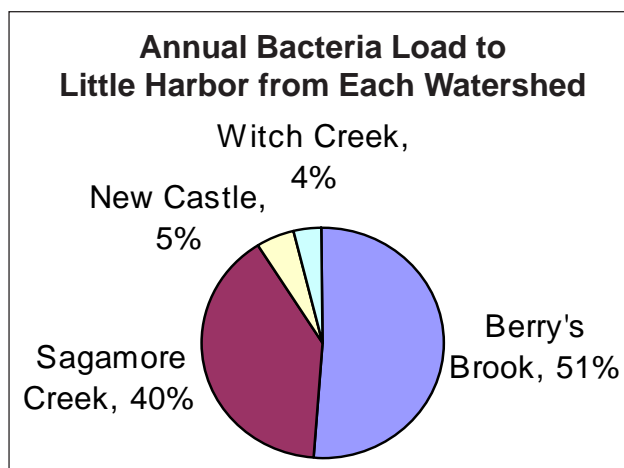
Berry's Brook Storm Event Sampling, UNH Office of Sponsored Research (2002 Restoration)

Grant Amount: \$3,780 Local Match: \$7,373

Berry's Brook Pollution Source identification Study, UNH (2002/2003 Restoration)

Grant Amount: \$20,000 Local Match: \$13,282

Berry's Brook, located in Rye is a subwatershed of the Little Harbor Watershed. It is impaired for aquatic life and primary contact recreation. Little Harbor is impaired for fish consumption (PCBs), shellfishing (dioxin, fecal coliform, PCBs and mercury) and primary contact recreation (Enterococcus). The TMDL study completed by DES for Little Harbor in 2006 indicated that bacteria loads to Little Harbor need to be reduced by 12 percent in order to attain water quality standards. In Witch Creek and Berry's Brook, the TMDL stated that the urban storm water allocation needs to be reduced by 95 percent in order to reach the TMDL. This project was designed to better characterize and identify the sources of bacterial pollution in Berry's Brook that are resulting in limitations to recreational shellfish harvesting and swimming in Little Harbor and Berry's Brook during wet weather events.



Ribotyping, a microbial source tracking approach using DNA fingerprinting analysis of *E. coli* isolates, was used as the microbial source tracking technique to identify the sources of contamination. Three sites along Berry's Brook were selected for sampling. Using volunteers coordinated by the Great Bay Coast Watch, Sea Grant Program, samples were collected during wet weather events at each site. Samples that did not meet water quality standards for *E. coli* were then used for comparison to ribotypes of fecal material from species found in the watershed, including human, dog, gull, otter, goose and rabbit. After comparisons of the collected samples to results found in local and regional databases, nine different source species were identified. The identified source species also included mixed wildlife and mixed birds as successful identifications. The most commonly identified source species was raccoon (15 isolates), followed by wildlife (10), humans/septage (8), dog (5), rabbit (3), gull (2) and mixed birds, fox, muskrat and deer with a single isolate each. The results from this project in conjunction with the TMDL will further assist watershed planners in developing BMPs in the Berry's Brook watershed to reduce NPS bacteria pollution in order to meet water quality standards.



Great Bay Coast Watch sampling volunteers.

Management of Non-Human Sources of Bacterial Pollution in Hampton/Seabrook Harbor, UNH (Base 2004)

Grant Award: \$58,864 Local Match: \$39,348

Hampton/Seabrook Harbor is impaired by bacterial pollution that limits shellfishing and primary contact recreation. Recent ribotyping studies identified human and non-human (birds, pets, livestock, wild animals) fecal contamination as significant pollution sources in the Harbor. Whereas methods for management of human sources are well known, management of non-human sources is less straightforward. Of particular interest are the typical locations for the different non-human sources in urban/suburban areas and the pathways by which these sources of fecal coliform and *E.coli* reach the Harbor. This study was developed to provide further understanding of the specific transport pathways of fecal contaminants. The results will be used to inform the creation and implementation of BMPs that could reduce bacterial pollution from non-human sources.

The project was conducted in the Town of Hampton and two specific areas of concern were evaluated: study area 1 included a catchment area near Route 1 that drains directly to the estuary, and study area 2 encompasses the catchment area around the Hampton police station. These areas were selected based on the results of previous sampling that showed elevated fecal coliform concentrations at these locations. Dry and wet weather sampling was conducted in both study areas and the samples were analyzed using the ribotyping method to determine potential source species.

The project results suggest that the most prevalent types of source species are different at the two study areas and will therefore require different management strategies. Non-human related sources (wild animals and birds) outnumber human-related sources at study area 1. While bird feces transported via runoff from rooftops may be managed using low impact development, the high prevalence of wild animal sources may be more difficult to address. Study area 2 had a high prevalence of human-related sources (i.e. pet waste), which if addressed successfully could provide a significant level of improvement in water quality to that area.

Catch Basin Replacements-Phase 2, Town of Seabrook (Restoration 2003)

Grant Award: \$3,408 Local Match: \$2,273

Estimated Pollutant Load Reductions: total suspended solids 19 lbs/yr

This project addressed sources of contamination identified in a 2003 TMDL that documented elevated bacteria concentrations in Hampton/Seabrook Harbor after storm events, resulting in closure of shellfish harvesting areas. The town of Seabrook inspected 139 catch basins in the beach area and identified those that were in defective condition. Specifically, those designed without a sump were more prone to releasing debris, bacteria and other contaminants during storm events that would eventually discharge via an outfall to the Hampton/Seabrook Harbor. This project resulted in the replacement of three catch basins with new structures. A previous 319 grant resulted in the replacement of an additional seven catch basins. The new structures have a minimum two-foot sump that will allow for sediment and debris to settle in the sumps and be less likely to discharge to the Harbor during wet weather events. The town will continue to address, replacing as necessary, substandard catch basins. Estimated load reductions were calculated using the region 5 model, which shows that each catch basin will reduce loading from total suspended solids by 19 pounds per year.

Silage Storage BMP Implementation, Scruton's Dairy Farm (Restoration 2001)

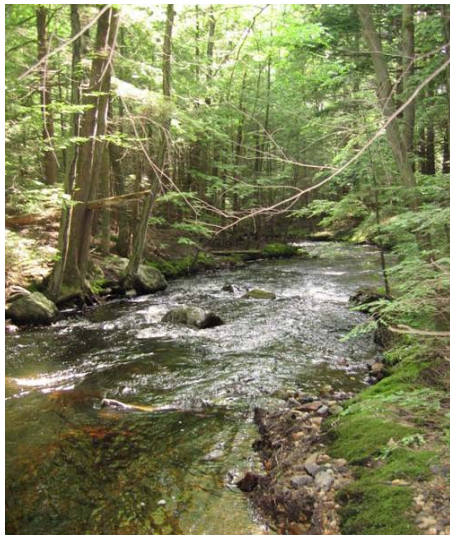
Grant Award: \$13,387 Local Match: \$11,353

This project was actually completed during FFY 2006, but was not included in the 2006 Annual Report. The outcomes involved the repaving of a silage bunker to decrease the amount of leachate that could discharge to a wetland and then an intermittent stream, which eventually flows into Rickers Brook and Axe Handle Brook before reaching the Cocheco River.

Exeter River Watershed Benthic Index of Biological Integrity, United States Geological Survey (2003 Restoration)

Grant Amount: \$8,000 Local Match: \$5,336

This project enabled DES to utilize data gathered during a 2005 U.S. Geological Survey (USGS) biological (macroinvertebrate) monitoring study to assess the attainment of designated uses in the Exeter



USGS sampling site at Fordway Brook, tributary to the Exeter River.

River watershed. The 2005 study was implemented by the NH Coastal Program and the USGS to assess the impacts of varying amounts of impervious surfaces and urban land on water quality (as measured by biological parameters) at 24 stream sites in the Exeter River watershed. For this project, USGS analyzed results from the 2005 study to aid DES in the determination of aquatic life use designations for eleven subwatersheds of the Exeter River watershed and to illustrate linkages to potential management actions where aquatic life use determinations were attained. The results of the biological integrity analysis will also be applied to a subsequent DES project, the Exeter River Watershed Vulnerability Analysis (VA), which will identify waterbodies in the watershed that are most vulnerable to the impacts of future development and population growth. Results from the VA will be used to prioritize subwatersheds for restoration planning.

Protecting Water Resources in New Hampshire's Coastal Communities, UNH Office of Sponsored Research (2004 Base)

Grant Amount: \$22,563 Local Match: \$37,612

In order to assist coastal communities in addressing the impacts of rapid development on water quality, this project utilized the experienced resources of the New Hampshire Natural Resource Outreach Coalition (NROC) to help communities implement better natural resource protection planning as it relates specifically to water resources.

For this project NROC developed a digital slideshow that introduces nonpoint source pollution contaminants, sources, and effects as well as strategies that can be used to enhance protection at the municipal level. The slideshow is then followed by a series of facilitated sessions that help community members consider their town's own water quality issues and ways their water resources can best be protected. The desired outcome is for community members to carry out, with assistance, a specific water resources protection project suitable to their needs. The pilot water resources focused education



A NROC presentation on local water resources.

track was delivered in the towns of Wakefield and Rollinsford. Positive outcomes included increased participant knowledge on water resource issues, increased participant capacity to locate and use technical assistance, development of a water resources chapter for a master plan, hosting of a public forum, recruitment of additional community members for water resource protection projects, initiation of a river monitoring program, a river cleanup and leveraging of additional grants for water resource related projects. Groups in both communities continue to work on water protection projects as a result of this assistance.

NROC now has the design to continue to offer a water resources protection track to all of its communities. This pilot allowed the organization to test the educational presentation and facilitation process both of which will most likely continue to evolve and improve over time.

Wason Pond Remediation, Town of Chester (Base 2006)

Grant Amount: \$4,355 Local Match: \$4,221

Wason Pond, located in Chester, is a twenty plus acre pond that serves as a swimming and water recreation area and also provides valuable wildlife habitat. A former commercially operated campground on the lake was purchased by the town in 2001 as part of the Wason Pond Conservation and Recreation Area. The following objectives of this project were accomplished as part of the “de-developing” of the site: 1) installation of a clay dam between an old stump dump and the beach to prevent the leaching of excess organic constituents to the pond; 2) removal of approximately 30 discontinued septic system pipes; 3) removal of several existing shoreline structures; 4) re-grading of shoreline and re-establishment of riparian vegetation; and 5) discontinuance of roads and re-establishment of vegetation in a wet meadow area. The outcomes of these tasks are the cessation of discharges to the lake from discontinued septic structures and leachate from the stump burial site. In 2007, the town will continue with further improvements to the site to control NPS pollution with the installation of water bars along high traffic areas to the lake.



*Before and after shoreline restoration at former campground site on Wason Pond, Chester.
Source: Wason Pond Conservation and Recreation Area Restoration Grant Final Report,
Chester Conservation Commission.*

Connecticut River Watershed

Homestead Woolen Mills Dam Removal and Channel Stabilization (Restoration 2002)

Grant Award: \$19,614 Local Match: \$13,085

The Homestead Woolen Mills Dam is located on the Ashuelot River in the village of West Swanzey. The dam was built in 1910 at a site where dams have existed for over two centuries. West Swanzey was an early New England textile manufacturing village and also the location of water-powered grist and sawmills. In 1997, the result of a regularly scheduled dam inspection by DES revealed deficiencies requiring dam repair or removal. The owner, Homestead Woolen Mills, Inc., wished to obtain information on dam removal because the dam no longer served its original intended purpose. Natural re-



Homestead Woolen Mills Dam and Thompson covered Bridge, West Swanzey. Photo courtesy Stephanie Lindloff, American Rivers.

source agencies supported this alternative as the dam blocks migratory and resident fish from accessing high quality habitat in the Connecticut River basin. The town of Swanzey wanted to research the possibility of taking over ownership due to the cultural and historical significance of both the dam and the upstream Thompson Covered Bridge. Due to the various interests warranting consideration, an Advisory Group was formed with representatives from Homestead Woolen Mills Inc., town of Swanzey, DES, NH Fish and Game Department, NH Division of Historical Resources, US Fish and Wildlife Service, National

Oceanic and Atmospheric Administration, American Rivers, Connecticut River Watershed Council, The Nature Conservancy, Ashuelot River Local Advisory Council, and interested members of the public. A comprehensive feasibility study was initiated in 2004 to look at the options for restoring fish movement within this portion of the Ashuelot River while attaining dam safety, either through removal or repair with fish passage. The final study was released in September 2005 and addressed not only ecological issues, but also structural engineering, fluvial geomorphology, economics, historical and cultural resources. After a review of this information and a Town vote in March 2006, the town of Swanzey decided not to take over ownership of the dam. Following this decision, Homestead Woolen Mills, Inc. determined to move forward with the option of dam removal.

Based on the owner's wishes to move forward with the option of dam removal, a Scope of Work to address the design, engineering and permitting was developed by Vanasse Hangen Brustlin, Inc. (VHB) February 13, 2007. This 319 project provided funding to implement part of the Scope of Work to provide options for channel design and determine the best alternative for channel stabilization that considers fish passage as well as stabilization of the upstream Thompson Covered Bridge. VHB has determined that dam removal in and of itself is not the best engineered method based on current modeling and consideration to fish passage, channel stability and stability of the covered bridge. DES, VHB and the project partners will evaluate the alternatives and determine the best design for the final project that will address these issues.

Riparian Buffer Project Phase II, UNH Office of Sponsored Research (Base 1998/2003)

Grant Award: \$77,312 Local Match: \$65,534

The purpose of this project was to evaluate the effectiveness of riparian buffers at three previously es-

established demonstration sites along the Connecticut and Ammonoosuc Rivers. Due to flooding at one of the sites in June, 2002 only two sites were monitored for runoff data. The third site was only monitored for the establishment of the shrubs. The following observations were noted as a result of the study.

Typically on the main stem of larger rivers, soils are well drained and don't saturate easily. Due to dry soil conditions the buffer strips were slow to get established. Also, with the well drained soils along the Connecticut River, it took a significant amount of rain, at least 1.4 inches to generate enough runoff for monitoring purposes.

Results from a landowner's survey revealed that, in general, landowners realize the environmental, as well as economic value of maintaining adequate buffers. They felt that trees in the buffer can be compromised due to undercutting from the current resulting in further environmental damage. Many did not support wider buffers if there is no proven benefit. The average width of buffers surveyed was 40 feet.

If buffer strips can be planted without significant tillage, the loss of nutrients and sediments can be minimized. A summer seeding, or a seeding with a cover crop will help to reduce the risk of nutrient and sediment transport. Site characteristics need to be carefully evaluated when determining what type and size of buffer is required. The study found that much of the erosion and sediment loss occurred on a small percentage of the river frontage, mostly in flood chutes. In many instances, the flood chute area was also a major area of stream bank erosion. Slowing down receding flood waters may reduce the impact to the stream bank.

This project confirmed that there can be both profitability and environmental benefits to establishing buffers in areas where runoff and erosion is a problem. Buffer widths of 50 feet to 75 feet can have a very positive effect on reducing transport as well as added benefits. However, on some soils, this positive effect can be accomplished by buffers of 30 feet, depending on the site characteristics.

Merrimack River Watershed

High Profile, Flood-Induced, Geologic Event Leads to Unique 319 Restoration Opportunity on the Suncook River in Epsom (ongoing)

On May 15 and 16, 2006, after approximately 9.0 inches of rain fell on central New Hampshire, a breach in the river bank caused the Suncook River in Epsom, to follow a new path. This breach or "avulsion," resulted in a new channel upstream of both Bear Island and two dams located at the north end of Bear Island, with the new channel rejoining the old channel to the east of Bear Island. After May 16, there was no flow in the western reach and in the northeastern reach of the Suncook River around Bear Island. Instead, the Suncook River created a path through a gravel pit resulting in a channel to the east of its former location within a new valley.



The dramatic result of the Suncook River avulsion after the May 2006 floods, Epsom.

The May 2006 Suncook River avulsion in Epsom was the highest profile geologic event occurring in the state since the collapse of the Old Man of the Mountain in 2003. Rivers commonly change course in the form of meander cutoffs and small-scale avulsions within floodplains of braided systems, but the Suncook avulsion was unusual because the new channel cut through an area outside the documented 100 and 500-year floodplains. The newly formed channel cut through approximately a half mile of new valley floor, abandoning one and a half miles of old channel in the process.

Approximately 150,000 cubic yards of sediment were introduced into the Suncook River as a result of the new channel flowing through a gravel pit and adjacent wetlands. Up to five feet of silt and sand were deposited downstream of the avulsion impacting 41 acres of cropland, four acres of forest, and 22 acres of pasture. In addition to the sedimentation impacts within the active river corridor, the dewater-

ing effects within the two abandoned channels of the Suncook River threatened one of the largest populations of state-endangered brook floater mussels (*Alasmidonta Varicose*) ever recorded in New Hampshire.

The Suncook River avulsion had detrimental effects upon the physical environment, biological communities, and various elements of man-made infrastructure within the river corridor generating hazards downstream all the way to the Merrimack River. In an effort to begin a science-based response effort to address the causes and possible restoration options linked to the avulsion, the Town of Epsom stepped forward and secured a



Abandoned channel of the Suncook River.

Section 319 Restoration grant to evaluate restoration alternatives. The town of Epsom encumbered \$16,000 in cash match at their 2007 town meeting leveraging \$24,000 in 319 Restoration funds for a total project budget of \$40,000. Although this 319 Restoration Project has a limited budget and a geographic scope focused only upon the avulsion site within the town of Epsom, the funding commitment from DES has acted as a catalyst for leveraging over \$800,000 from various project partners including USGS, FEMA, and the DES Dam Bureau. These additional projects will provide one-foot contour mapping within the avulsion area; four-foot contour mapping from upstream of the avulsion downstream to the confluence with the Merrimack River; and generate a sediment transport and flood recovery map for the river corridor. The information generated by these closely linked projects will provide the data necessary for the development of management alternatives for the river corridor that includes the avulsion area and the downstream reaches to the confluence with the Merrimack River.

Rust Pond Diagnostic Study, NHDES Biology Section (2001 Base)

Grant Award: \$5,787 Local Match: \$3,858

Rust Pond, located in Wolfeboro, is a 210-acre water body with an average depth of 24 feet. The watershed encompasses approximately 1,651 acres and includes the towns of New Durham and Brookfield.

Due to a decrease in hypolimnetic oxygen, an increase in nutrient concentrations from the North Inlet and an increase in aquatic plant growth, the Rust Pond Association requested that DES conduct a diagnostic study to evaluate potential threats to the lake. The study began July 2001 and was completed in June 2002. The Watershed Assistance Grant was used to fund laboratory costs and the printing of the final report. The results of the study reveal that although Rust Pond is classified as oligotrophic, it is showing signs of slight mesotrophic conditions that suggest the lake is being impacted from watershed development. The study provides a list of potential threats along with recommended actions to ensure that the lake's current trophic status is maintained as the watershed deals with increasing development pressures.



Rust Pond, Wolfeboro.

Installation of BMPs at Swain Farm, Belknap County Conservation District (2001/2002 Restoration)

Grant Award: \$51,130 Local Match: \$34,159

Estimated Pollutant Load Reductions: Nitrogen 740 – 980 lbs/yr; Phosphorus 180 – 245 lbs/yr

For five generations, the Swain family, and the Hunkins family have been dairy farmers in the Hunkins Pond watershed. Hunkins Pond provided ample drinking water for livestock, a swimming hole, fishing destination, and wildlife habitat for several hundred years. Hunkins Pond also forms the headwaters of Barker Brook, which eventually outlets into Lake Winnisquam. Over the years the intensive agriculture in the 250-acre watershed has negatively impacted Hunkins Pond. In 1989, a DES Trophic Survey Report classified the pond as eutrophic with a chlorophyll-a value of 19.49. In 2007 the chlorophyll-a value was 32.15, which corresponded to a toxic cyano bloom in the Pond. Hunkins Pond is currently listed as impaired for primary contact recreation due to excessive chlorophyll-a and *cyanobacteria hepatotoxic microcystins* in the water column.



View of Swain Farm pasture and Hunkins Pond.

The elevated levels of chlorophyll-a, and reduced water clarity within Hunkins Pond raised concerns among abutting property owners, visitors to the pond, and the Swain family. In response to the concerns over eutrophication in Hunkins Pond, the Belknap County Conservation District (BCCD) began consulting with the Swain family about potential best management practices

(BMPs) for the farm. The USDA Natural Resources Conservation Service (NRCS) also became quite involved in the process of discussing nutrient load reduction measures at Swains Farm. Mike Lynch, the Merrimack-Belknap Counties District Conservationist, suggested a scope of work and budget for a project that would focus upon manure management and rotational grazing within the watershed.

The NRCS worked with the BCCD and the Swains through the entire process of on-site design, cost/

benefit analyses of various BMPs, budget development, and other assistance that generated information sufficient for grant applications to be submitted to various agencies. The NRCS, BCCD, and the Swains eventually agreed upon several BMPs that were ultimately funded by this Section 319 Watershed Restoration Grant with a large portion of non-federal cash match provided by a New Hampshire State Conservation Committee Moose Plate Grant award.

The results of the BMP installations is the separation of “clean” rainwater from manure in heavy use areas and the control of livestock access to pastures adjacent to Hunkins Pond. One of the priority management measures accomplished by the project was the repair of both the east and west manure pits that had previously been constructed with wood that had long since rotted away. The installation of concrete waste blocks in both of these locations, provides ample storage and containment of manure while allowing equipment better access for cleaning out the pits periodically. The reinforced manure storage pits now provide structurally sound containment for the manure generated in the heavy use areas that are scraped daily.

The construction of a 14-feet by 40-feet concrete walkway behind the dairy barn in conjunction with a stone dust and gravel path for the dairy cows proved to be a successful BMP with significant nutrient reduction realized almost immediately. Prior to construction, the dairy herd would be turned out to pasture from the barn and travel approximately 380 feet on Hunkins Pond Road to the lower pasture. Cows typically defecate once they leave the barn, and in this case, the manure was deposited onto asphalt, which created the perfect nutrient and bacteria conduit that discharged directly to Hunkins Pond. It was estimated that approximately 1,000 pounds of manure was deposited onto Hunkins Pond Road



Cows feeding under new hoop-style roof at Swain Farm.

each time the herd was released to the lower pasture. By constructing the concrete walkway, gravel and stone dust path to the lower pasture, coupled with fencing and a pasture pump, it is now calculated that during a 10-year, 24 hour rainfall event, 19,700 gallons of manure contaminated runoff will be prevented from reaching Hunkins Pond. A net phosphorus runoff reduction between 30 and 45 pounds per year will also be realized through the implementation of this particular BMP in the watershed.

Certainly the most visible structural improvement at the Swain Farm is the 50-foot by 96 foot “hoop-style” heavy use area roof that now prevents “clean” rainwater from mixing with manure deposited by the dairy herd. This particular BMP included the resurfacing of the heavy use area floor to an impervious surface of textured concrete that facilitates easier scraping and removal of manure while providing better footing for the herd. In addition to the roof over the heavy use area, the Swains also invested much of their time and resources to construct a gutter system for the roof that directs roof runoff into vegetated treatment plots outside of the manure storage and cow walkway areas. Calculations performed by the NRCS reveal that the roof alone has accounted for a 150 ton recovery of manure to storage areas that had previously gone un-recovered and allowed to mix with rainwater. By separating the roof runoff from the manure, the contaminated runoff that used to leach toward Hunkins Pond has been reduced by approximately 88,000 gallons. This equates to a phosphorus runoff reduction between

150 to 200 pounds per year and should ease the stressors of eutrophication upon Hunkins Pond.

In addition to the various structural BMPs installed as part of this 319 Watershed Restoration Grant, the BCCD and the Swain family conducted a large variety of educational and outreach events within the watershed. One of the benefits of this particular agricultural BMP project is the fact that the Swains operate a year-round farm stand on the premises, and they have a steady flow of people coming through the property. The Swains created a project “story board” and photo album that are on permanent display in their store for the public to learn about the project. Workshops were organized by the BCCD and hosted by Swain Farm for beginning farmers, town officials, and the general public respectively. The workshops focused upon the BMPs implemented on site, soil and nutrient management, and watershed sensitive landscaping. One of the more innovative elements to the education and outreach tasks associated with this project was a winter workshop where sledding down the hill toward Hunkins Pond was used as an analogy for polluted runoff generated in the watershed reaching Hunkins Pond.

Annual water quality monitoring of Hunkins Pond was also initiated during the 319 project period under the New Hampshire Volunteer Lake Assessment Program (VLAP). Participation in VLAP not only provides additional education and outreach, but will provide an assessment tool to monitoring the expected benefits upon pond quality as the full impact of the BMPs are achieved over time.

With the 319 Watershed Restoration Grant project now complete, the BCCD is putting forth efforts to focus upon in-lake nutrient management efforts for Hunkins Pond. Using the 319 project as a catalyst, the BCCD has applied for funding through the USDA Conservation Innovation Grant Program to install floating bio-islands that are designed to remove soluble phosphorus from the water column. The BCCD also secured contracts to install wind powered water pumps that will provide drinking water for cattle on the other pastures within the watershed that are being utilized as part of the rotational grazing program instituted in 2006. In addition, the NRCS is considering the farm for a demonstration site for a small manure digester, which would allow the Swains to bag and sell a marketable fertilizer, thus reducing the amount of manure that is directly land applied. These innovations in agricultural watershed management and in-lake treatments will serve to promote the Swains Farm and Hunkins Pond as a model for small watershed agricultural management.

Nashua Wetlands Buffer Outreach, City of Nashua (2004 Base)

Grant Award: \$8,025 Local Match: \$15,748

The purpose of this project was to protect and maintain vegetated buffers around Nashua’s prime and critical wetlands to prevent and reduce non-point source pollution to the Merrimack and Nashua Rivers, Pennichuck and Salmon Brooks and other important tributaries and ponds.

The city developed and printed 5,000 Wetlands Buffer brochures. The brochure was distributed at 2,400 homes and businesses, and made available at the Conservation Commission’s website. Approximately 75 wetland marker signs were posted and installed around wetland



Wetlands with buffer marker installed.

buffers bordering city owned property. Follow-up inspections occurred a year later. Although most of the posted areas were clean, a few showed signs of dumping around the posts. This resulted in the installation of new, more stringently worded, signs; a published newspaper article; and the mailing of 50 violation letters to neighboring property owners.

Communication with residents and on-site observations revealed that the outreach campaign educated and influenced the activities of many, however changing the habits of some people will take continued efforts.

Webster Lake Watershed Management Plan – Planning Phase (2005 Base)

Grant Award: \$30,000 Local Match: \$23,747

Webster Lake is located in the city of Franklin with 75 percent of its watershed located in the town of Andover. It is a popular lake that is extensively used for recreational activities including swimming, boating and fishing. The lake is approximately 610 acres in size with a maximum depth of about 39.0 feet and an average depth of 17 feet. The lake's primary water inflow is provided by Sucker Brook, which originates approximately 12 miles upstream at the outlet of Highland Lake located in Andover.



Legace Beach, Webster Lake.

During August of 2003 and September of 2004, significant outbreaks of nuisance blue-green algae, including cyanobacteria, were observed in Webster Lake, which greatly diminished its use for recreational purposes and posed a human health threat. These outbreaks prompted several meetings and workshops with DES personnel, Webster Lake Association members and municipal officials to try and identify the sources of the problem and appropriate corrective measures. Recently DES included Webster Lake on the 2006 303(d) list of impaired water bodies due to the reoccurrence of cyanobacteria. Ongoing water quality sampling conducted by DES personnel and Volunteer lake Assessment

Program (VLAP) monitors have also revealed occasional elevated levels of turbidity, phosphorus and E. coli bacteria.

This grant was awarded to the town of Franklin for the purpose of developing a Watershed Management Plan to address these pollutants of concern, in particular phosphorus. With Highland Lake being in the Webster Lake watershed, it was recognized early on in the process that community members of Andover and the Highland Lake Association should be included in the plan development process since measures that could improve water quality in Webster Lake could also benefit or be directly applicable to the Highland Lake watershed. The Webster-Highland Lakes Watershed Partnership was established in late summer-early fall of 2005 to help guide the development of the plan and prioritize the issues and concerns. The partnership is comprised of municipal officials from both Franklin and Andover, lake association members, DES personnel and other at large community members. Three listening sessions were conducted in the summer of 2006 to share views, concerns and suggestions re-

garding water quality and the pollutant sources that exist within the watershed.

Since 1992 VLAP summer samples show total phosphorus concentrations averaging 6 ppb to 12 ppb with a maximum of 15 ppb in the epilimnetic (upper water) layer of the lake. Average concentrations taken in the deep water layer (hypolimnion) have been consistently above the median level observed in other New Hampshire lakes for the same time period with maximum hypolimnion concentrations exceeding 100 ppb in seven out of 20 years. In April 2006, a surface water sample collected in Webster Lake immediately after ice-out, when lakes are typically in a well-mixed condition, showed a phosphorus concentration level of 15 ppb. This recent sampling combined with land use modeling concluded that the “well-mixed” in-lake phosphorus concentration in Webster Lake is closer to 15 ppb. It was determined that to improve water quality conditions in Webster Lake, the well-mixed in-lake phosphorus concentrations should be closer to 11 ppb or 12 ppb. This proposed reduction would also provide a buffer against any short-term, episodic influxes similar to those that may have occurred in 2003 and 2004. This means that in order to lower the in-lake concentrations by 3 ppb, the current phosphorus loads need to be reduced by approximately 140 kg/yr.



Cyanobacteria bloom, Webster Lake.

The Webster/Highland Lakes Watershed Management Plan outlines potential sources and the watershed actions necessary to achieve these phosphorus load reductions. Sources contributing phosphorus include residential development; manure from animals including that applied as fertilizer; construction activity; outdated and failing septic systems; timber harvesting; stormwater runoff; sediment erosion; pet wastes; use of detergents; and internal loading from bottom sediments. Although the largest reductions could be achieved through a combination of manure management measures and septic system upgrades for shoreline lots around Webster Lake, there is no one particular source where the entire recommended load reduction can be achieved with a single economically feasible fix. This reinforces the need to initiate a multifaceted approach with the residents and stakeholders within the watershed working together to implement the various corrective measures identified in the plan.

Mill Brook Stabilization, Town of Thornton (2002 Restoration – Incomplete)

Grant Award: \$14,367 Local Match: \$34,086

The headwaters for the Mill Brook watershed in Thornton, New Hampshire lie within the White Mountain National Forest, draining the western slopes of Mt. Tecumseh. Within this 13 square mile watershed, Mill Brook exhibits a number of alternating stream and valley types as it makes its way to the Pemigewasset River. As Mill Brook winds its way to the confluence with the Pemigewasset River, it flows through several constricted valleys where the side slopes are extremely steep and vulnerable to the erosive forces of an active channel.

The combination of a narrow, active floodplain, steep valley walls, and the position of Mill Brook Road on the outside bend of a meander created an opportunity for undermining at the toe of slope, channel migration, and infrastructure instability. In 2003, the town of Thornton was awarded a Watershed Res-

toration Grant for the stabilization of the valley wall, and restoration of Mill Brook at the project location. Principles of fluvial geomorphology, natural channel design and vegetative slope reinforcement were to be used to accomplish these goals.

This project was intended to remedy water quality and aquatic habitat problems due to ongoing sedimentation resulting from active bank erosion. The town of Thornton and their consultant completed the historical data collection, field survey work, development of a restoration plan, and the permitting necessary for implementation.

Unfortunately, the primary abutter to the project area withdrew their support for the restoration plan, and construction of the in-stream and slope stabilization measures were never implemented as a result. The lands owned by the primary abutter span both sides of Mill Brook and were essential for heavy equipment access as well as creation of an active floodplain. Even though the unwillingness of the primary abutter to accept the restoration plan proposal defeated any attempts to realign Mill Brook into a proper plan form and cross-sectional area, the town of Thornton needed to find a solution to the Mill Brook Road instability problem as it posed a public safety hazard. Luckily, an abutter to Mill Brook Road was willing to provide an easement that allowed Mill Brook Road to be repositioned further away from the top of slope that had been actively eroding due to the channel migration of Mill Brook.

Although the project did not result in implementation of the geomorphological restoration plan for Mill Brook, it did generate valuable information that can be used in the future should land access become available. The Mill Brook Restoration Plan generated the data needed to provide meaningful information to the town of Thornton relative to restoring and realigning the brook, improving aquatic habitat, and stabilizing the banks to reduce erosion and sedimentation. If in the future, the primary abutter is willing to allow the Town to pursue restoration of Mill Brook at this location, the information generated by this project will be invaluable in assisting project partners as they move forward.

Statewide Projects

New Hampshire's Natural Stream Communities, UNH Office of Sponsored Research (1998/2002/2002 Base)

Grant Award: \$127,861 Local Match: \$85,241

The project implemented a multivariate predictive model to predict reference conditions for biological assessment and habitat assessment of streams. The subject of a PhD dissertation, the project collected macroinvertebrate, vertebrate, and habitat data on 76 first to fourth order streams determined to be characteristic of minimally developed New Hampshire watersheds. The project resulted in a predictive methodology that can be combined with biomonitoring techniques to assess aquatic life use support.

Stream Channel Stabilization and Natural Stream Channel Design Guidelines, NHDES Rivers Management and Protection Program (2004 Base)

Grant Award: \$29,500 Local Match: \$20,000 (provided by NH Department of Transportation)

The *Guidelines for Naturalized River Channel Design and Bank Stabilization*, its accompanying *White Paper*:

Fluvial Geomorphology and River Restoration and an *Electronic Library* are the results of a four-year collaborative effort funded by DES, New Hampshire Department of Transportation and EPA Section 319 funds. These guidelines and resources provide the scientific justification and current approaches to the practice of naturalized river channel design and bank stabilization.

Historical human settlement near river systems and the resulting , often ad hoc, alterations made to address building, navigation and power needs have sometimes resulted in changes to river channels that have led to instability, reduced water quality and impairment of aquatic habitat. In the past several decades, much has been done to improve both theory and application of naturalized river channel design and bank stabilization. This continually growing knowledge has led to an expanded set of available design procedures and tools for local rehabilitation and enhancement as well as full system restoration. The following resources developed from this project will now offer those desiring to address the problems associated with a river's instability (i.e. erosion, sedimentation, loss of biological habitat) an expanded toolbox containing a broad range of well established empirical, analog, and analytical design methods.

The *Guidelines for Naturalized River Channel Design and Bank Stabilization* walks the user through different scenarios and considerations – from the planning stages of design to the implementations and funding associated with it and all aspects in between. To address the challenge of selecting appropriate design methods for each unique project a project classification system is presented that is based on the project goals, scope, physical site constraints, ecological risks, and likely level of societal acceptance. Classification of a project as routine, moderate, or comprehensive informs the planning process, guides selection of design methods, supports project implementation, and increases the chances for success in meeting goals and objectives. The *White Paper: Fluvial Geomorphology and River Restoration* succinctly provides the scientific background that supports a fluvial geomorphologic approach to river restoration and also the basic information needed to understand how to work with rivers' natural processes. The *Electronic Library* contains all the scientific and guidance documents referenced in the *Guidelines for Naturalized River Channel Design and Bank Stabilization* and the *White Paper: Fluvial Geomorphology and River Restoration*. This Library is the first compilation of its type and provides resource documents by federal, state, and Non-governmental organization practitioners and is organized in the following categories: bank stabilization, naturalized channel design, useful project technical information, roadways and river corridors, monitoring, and qualitative reports and policy papers.

For copies of these documents and the on-line resources visit www.des.nh.gov/rivers/guidelines_naturaldesign.htm.



Restoration of Bog Brook, Stratford, using natural stream channel design techniques.

Motor Vehicle Salvage Yards BMP Guide and Outreach, NHDES Waste Management Division (2002 Base)

Grant Award: \$35,023 Local Match: \$250,022

This grant was awarded to the DES Solid Waste Management Bureau in 2002 to support a new initiative to improve environmental performance at motor vehicle salvage yards (MVSYs), also known as the “NH Green Yards Program.” The 319 funds were used to provide BMP education and assistance to MVSY operators and their stakeholders. This assistance included publications to increase environmental awareness among facility operators; materials, supplies and guidance for implementing BMPs; on-site technical assistance for achieving compliance; and, incentives for going “beyond compliance.” Project partners included the NH Pollution Prevention Program, the Auto & Truck Recyclers Association of New Hampshire, NH Municipal Association, NH Auto Dealers Association, the NH Towing Association, NH Department of Transportation and the NH Department of Safety.

At the beginning of the project a survey was conducted that identified approximately 190 MVSY facilities operating in New Hampshire. The project began with the distribution of education and training materials, which included BMP picture post cards; a shop manual of 17 BMP guide sheets; various BMP and environmental awareness videos, such as “Storm Water Management for Auto Recyclers” (Sustainable Conservation, Calif.) and “The Right Way: Managing Auto Fluid Waste & Parts Cleaning” (State of Maine); an environmental compliance manual and checklist; and, a template for preparing a storm water pollution prevention plan. In addition, a number of training workshops and events were held during the project period for MVSY operators, municipal officials and other stakeholders.



The potential for surface and groundwater contamination from improper management of vehicular waste is apparent in this photo.



2006 N.H. Green Yards award ceremony on the State House steps in Concord.

As a result of this project, over 400 people attended one or more of 29 training events. A survey conducted two years after the program had been initiated revealed a significant increase in the number of MVSY operators implementing BMPs to minimize the impact of their activities on the environment. A follow-up phone survey after a June 2004 Storm Water Workshop resulted in 83 percent of the surveyed facilities reporting that they had conducted an initial storm water assessment of their yards and 100 percent reported that they had implemented one or more BMPs presented at the workshop.

After the initial outreach and education phase, DES instituted a pilot “Certified NH Green Yard” program to give special recognition to MVSYS that go beyond mere compliance and demonstrate exemplary work practices and a high level of commitment to environmental protection. At the completion of this project, this special recognition had been awarded to twenty facilities. DES intends to institutionalize this program statewide and encourage more facilities to attain this recognition.

To monitor compliance, 22 DES inspectors were trained to evaluate MVSYS for compliance within nine BMP compliance areas. As a result of inspecting over 180 of the identified MVSYS during the project period, roughly 40 sites were able to be “delisted” as they no longer existed or were no longer operating as MVSYS. After inspecting the facilities, DES staff issued each operator a “BMP Compliance Report Card” that identified what they were doing right and what they needed to change in order to comply with the BMPs. Unfortunately, although within each of eight BMP categories there is a compliance rate of 70 percent, less than 35 percent were in compliance with BMPs related to proper fluid management and fewer than 15 percent of the inspected facilities were fully compliant with the BMPs in all nine BMP evaluation areas. Further, a dozen inspected facilities had to be referred for state monitored clean-up action, due to significant releases of petroleum products. These results demonstrate the need for continued education, technical assistance and compliance efforts. This will be an area of focus during Phase II of the NH Green Yards project, which is the compliance assurance and certification phase and is also being supported with Section 319 funds.

Looking Ahead

Within the next two years, our watershed partners will have developed watershed-based plans to restore twenty impaired watersheds. These plans calculate pollutant load reductions or habitat improvements needed for the impaired waters to meet standards, identify the actions needed to reduce pollutant loads and improve habitat, and outline how to quantify such improvements. After implementation, the long-term results are expected to be watersheds that meet water quality standards, like Bog Brook, Middle Brook Canal and Crystal Lake.

The watershed-based planning methodology produces clean water results. Having quantifiable water quality goals is a good way to insure that our actions will have an impact on water quality. While watershed restoration is critical to our state’s quality of life, it is just as important to take preventative measures in clean watersheds. In 2008, we will start work with watershed partners in the Granite Lake, Acton Wakefield, and Lake Winnepesaukee watersheds, following the lead of the Newfound Lake Association in 2007, to develop watershed-based plans designed to specify actions required to maintain high quality water, based on quantifiable water quality goals. In both impaired and high quality watersheds, this approach combines analytical approaches, including complex water quality modeling, with social marketing techniques to change behavior.

We look forward to the challenges ahead.

Appendices

A. Section 319 NPS Local Initiative Grants Awarded in FFY 2007

Grantee	Project Name	Project Number	NPS Category	Watershed	Source of Funds (FFY)	Grant Award
NH Dept. of Agriculture	Agriculture Nutrient Management Grant Program	N/A	Agriculture	Statewide	2007	\$30,000
Town of Chester	Wason Pond Remediation	B-06-C-05	Urban Runoff/ Stormwater	Coastal	2006	\$4,355
Town of Peterborough	Contoocook R. Urban Stormwater Improvements & BMP Demos	B-06-M-03	Urban Runoff/ Stormwater	Merrimack	2006	\$104,990
Flint Farm	Flint Farm Manure Storage & Milk House Waste Mgt. System	B-06-A-06	Animal Feeding Operations	Androscoggin	2006	\$57,650
Newfound Lake Assoc.	Newfound Lake Watershed Master Plan Dev. & Implementation	B-07-M-01	All sources	Merrimack	2007	\$184,000
Town of Tamworth	Chocorua Village Area Biore-tention Stormwater Treatment	B-07-S-02	Urban Runoff/ Stormwater	Saco	2007	\$50,000
Lamprey River Watershed Association	Lamprey R. Watershed Assessment of Water Quality & Physical Factors	B-07-C-03	All Sources	Coastal	2006	\$69,526
Town of Hancock	Hancock Village Stormwater Mgt. & Water Quality Improvement	B-07-M-04	Urban Runoff/ Stormwater	Merrimack	2003	\$94,800
Town of Newbury	Sunapee Hills Stormwater Mgt. Ordinances	B-07-CT-05	Urban Runoff/ Stormwater	Connecticut	2005	\$14,500
Outreach	Various	Various	Other NPS	Statewide	2004	\$8,496
			Total Awarded			\$618,317

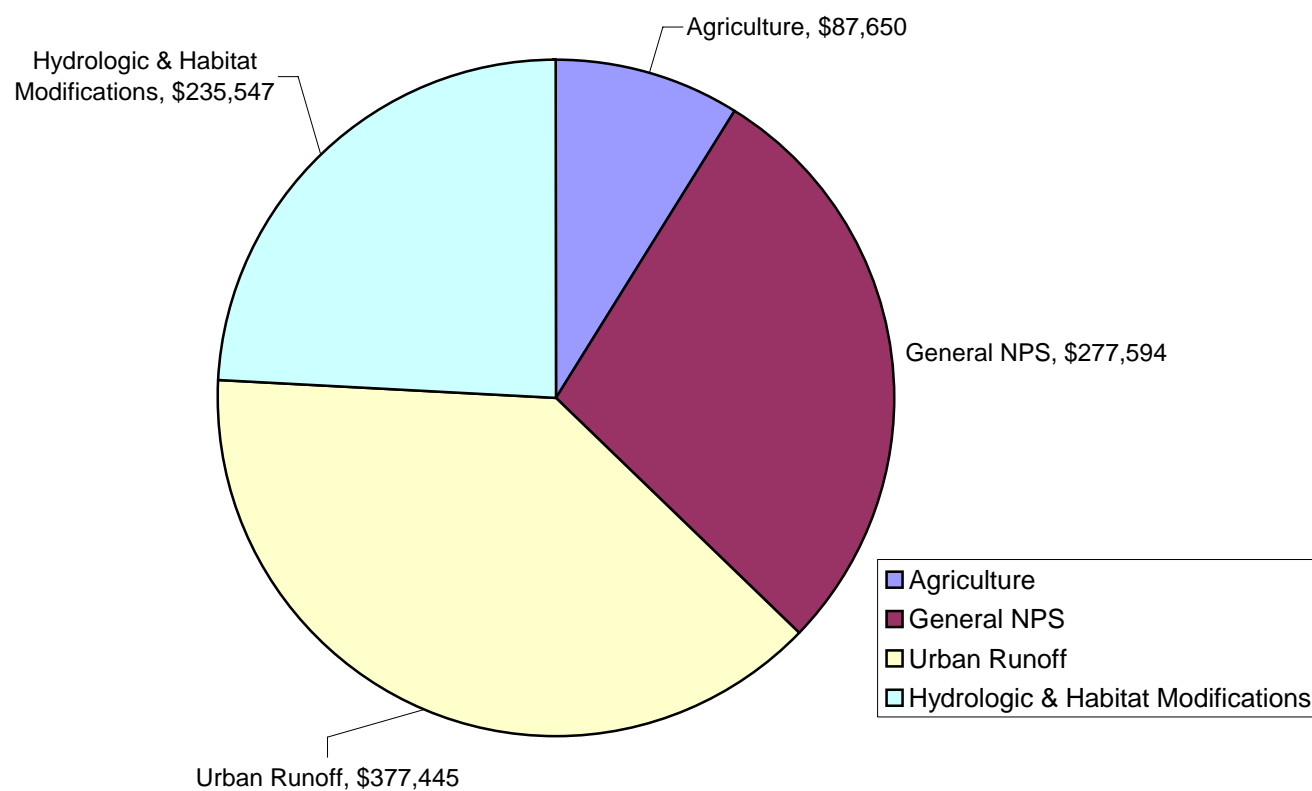
B. Section 319 Watershed Restoration Grants Awarded in FFY 2007

Grantee	Project Name	Project Number	NPS Category	Watershed	Source of Funds (FFY)	Grant Award
NHDES Dam Bureau	Homestead Wool Mills Dam Removal	R-02-CT-13	Hydromodification	Connecticut	2002	\$19,657
UNH Sea Grant Progr	Great Bay Coast Watch Sampling	R-02-C-06	Urban Runoff/ Stormwater	Coastal	2002	\$3,780
UNH	Berry's Brook Pollution Source ID	R-02-C-07	Urban Runoff/ Stormwater	Coastal	2002 & 2003	\$20,000
USGS	Exeter R. Watershed Benthic Index	R-03-C-11	All sources	Coastal	2003	\$8,000
Conn. R. Joint Comm	Restoration Plan for Mill Brook Confluence w/ Upper Ammonoosuc R.	R-05-CT-07	Hydromodification	Connecticut	2005	\$24,390
Town of Epsom	Geomorphic Based Restoration Plan for Suncook R.	R-06-M-03	Hydromodification	Merrimack	2006	\$24,000
Swift R. LAC	Swift R. Restoration, Conway	R-06-S-04	Hydromodification	Saco	2006	\$48,000
Trout Unlimited	Nash Stream Restoration Project	R-06-CT-05	Hydromodification	Connecticut	2004	\$199,500
Blue Ocean Society	Hodgson Brook Watershed Restor.	R-05-C-13	Urban Runoff/ Stormwater	Coastal	2006	\$85,020
Town of Greenland	Greenland Pet Waste Outreach	R-05-C-08	Other NPS	Coastal	2005	\$4,770
Blue Ocean Society	Pet Waste Outreach	R-05-C-09	Other NPS	Coastal	2005	\$2,802
			Total Awarded			\$359,919

C. Agricultural Nutrient Management Grants Awarded SFY 2007

Recipient	Town		Operation Type	Award	Waterbody Management Practice
Tom Beaudry	Walpole	Dairy farm	\$2,000	Aldrich Brook	Reconstruct manure pit
Robert F. Drown Jr.	Webster	Dairy farm	\$2,500	Blackwater River	Extension of heavy use area
Rocky Meadow Farm	Chichester	Cattle farm	\$2,500	Suncook River	Creation of controlled waterway through farm
O'Rourke Farm	Chichester	Dairy and sheep far	\$2,500	Little Suncook River	Allow separation of pasture parcels for rotational grazing
Porkside Farm	Henniker	Pig farm	\$2,500	Cow Brook, French Pond	Manure Pit drainage and pasture rotation
Edwin C. Remick Foundation	Tamworth	Farm museum	\$2,500	Swift River	Culverts at crossings, manure pads, etc.
Mountain Shadow Farm	Thornton	Family farm	\$2,500	Mad River	Manure composting bin
Mocking Bird Farm	Lee	Family farm	\$2,500	Turtle Pond & wells	Reduction of nutrient runoff
Derek Owen	Hopkinton	Working family farm	\$2,500	One Stack Brook	Construction of manure storage
Dorn Cox	Lee	Family farm	\$2,500	Lee 5 Corners Brook	Fence livestock from brook
Jim Snyder	Canterbury	Cattle farm	\$2,327	Guest Meadow Brook	Construction of livestock crossings
Scruton Farmstead	Farmington	Livestock farm	\$2,500	Cocheco River	Barnyard improvements
Christopher Albert	Nottingham	Equine Facility	\$2,150	Lamprey River	Construction of manure storage
UNH - Glenn Pierce	Durham	Educational Farm	\$2,500	Lamprey River	Construction of controlled crossings
Top Hat Stable	Auburn	Equine Facility	\$2,500	Massabesic Lake	Construction of manure storage
Andy Gingue	No. Stratford	Livestock Farm	\$2,500	Hoskins Pond	Manure storage
Crown Point Alpaca Farm	Stratford	Alpaca farm	\$2,500	Berry's River	Construction of concrete manure composting structure
Elizabeth McCann	Lyme	Dairy farm	\$2,162	Grant Brook	Fencing along river banks
Red Hill Horse Farm	Tamworth	Equine Facility	\$2,500	Little Sugar River (Ossipee Lake watershed)	Spreading manure away from waterbody
Steve Goss	Pike	Dairy farm	\$2,500	Oliverian Brook	Repairs to water crossing
John W. Luther	Acworth	Dairy farm	\$2,500	Cold River/Great Brook	Roof over heavy use area and keep water out of manure pit
Jeff Holmes	Langdon	Dairy farm	\$2,500	Connecticut River watershed	Install gravity discharge milkhouse waste disposal
Thomas Toward	Croydon	Cattle farm	\$2,500	Spectacle Pond	Construction of manure storage pad
Riverfare Farms LLC	Webster	Equine Facility/ Cattle farm	\$2,500	Blackwater River	Long-term nutrient management
Naim Syed	Canterbury	Goats and lambs	\$2,500	Merrimack River	Install roof over manure storage
TOTAL			\$61,139		

D. Distribution of Section 319 Grant Dollars Awarded in 2007 by NPS Category



E. Distribution of Section 319 Grant Dollars Awarded in 2007 by Watershed

